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EXAMINER	
WEBB, GREGORY E	
ART UNIT	**PAPER NUMBER**
1751	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/786,237	Applicant(s) STAUB ET AL.	
	Examiner Gregory E. Webb	Art Unit 1751	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *8-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-7 and 20* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0704*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

4/25/06

Election/Restrictions

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-7, drawn to spray arm with plurality of articles, classified in class 15, subclass 309.2.

II. Claims 8-19, drawn to tank cleaning apparatus, classified in class 15, subclass 246.5.

III. Claim 20, drawn to method of cleaning hollow work piece, classified in class 134, subclass 22.1.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and (II,III) are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different designs, modes of operation, and effects (MPEP § 802.01 and § 806.06). In the instant case, the different inventions have different modes of operation.

Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

During a telephone conversation with Dennis Daly on 4/18/06 a provisional election was made with traverse to prosecute the invention of II, claims 8-19. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-7 and 20 are withdrawn from

further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The examiner has reviewed the applicant's specification. By the applicant's own admission, it is well known in clean-in-place (CIP) technology to use static and dynamic spray devices. The applicant further admits that it is well known to use gas/liquid mixtures in CIP processes.

Concerning the "back pressure," volumetric ratios of gas/liquid, and the general flow rates, although these may not be reported in the prior art, such properties would generally be inherent to CIP processes. Specifically referring to the applicant's claim limitation of "back pressure," it is admitted on page 8 of the specification that prior spray balls generate larger back pressure than the instant invention. However, the applicant never provides a definitive statement that these prior back pressures are known or even capable of being measure. The applicant merely states that these high back pressures are "expected." This is clearly an admission that these values are rarely reported as even the applicant does not know what back pressure comparative spray heads provide. The applicant is therefore basing the novelty on a property that the applicant admits is

not known in prior inventions. It is unknown how the examiner should be capable of determining these values. Thus the burden of showing these properties as not being inherent clearly falls on the applicant and not the examiner.

The examiner expects either specific data showing these back pressures are not met or at least a logical reasoning as to why this limitation is not met. Merely stating that the prior art fails to teach these features is not sufficient for overcoming the prior art as the applicant has already admitted that they are unknown properties.

Claims 8-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Tabani, Yacoob (US20040007255).

Concerning the clean-in-place and the two-phase, Tabani, Yacoob teaches the following:

An apparatus and method for cleaning passageways and the like with a two-phase mixture of gas under pressure and an aqueous cleaning solution. The two-phase cleaning mixture is generated in a module and is passed out of the module at a predetermined rate that determines droplet size, velocity and droplet density at the pipeline surface to be cleaned. The droplets impact the walls of the passageway to be cleaned, thereby fragmenting, eroding and removing contaminants in said passageway. These are then flushed out of the passageway by the two-phase flow. The flow of cleaning solution can be steady or pulsed. The apparatus and process

include a clean-in-place system that is useful in food, beverage, pharmaceutical and similar process industries.(see abstract)

Concerning the liquid phase, multiple phase, gas to liquid ratio and the inlet line, Tabani, Yacoob teaches the following:

[0086] As discussed above, a two-phase flow can be created, in situ, in the membrane lumen by mixing the backflushing liquid with air from the air source 10. The gas to liquid ratio in this case is adjusted by controlling the backflushing liquid and air pressures. This step is done by introducing air to the inlet adapter which is connected to the inlet of the membrane to be cleaned via pipe segments 126, 128, 130, 132, 134, 136, 138, 140, and 142 through valves 46 and 54 and the two phase generating module 12. Air in this path is regulated by the regulator 66 and monitored by the pressure transducer 72. With the two-phase flow generated in situ in this case, the mist separator 500 is collecting two-phase exhaust rather than liquid phase only. Liquid is separated from the two-phase exhaust inside the mist separator 500 and discharged via pipe segment 152 through valve 64; air is discharged via pipe segment 154.

Concerning the gaseous phase, Tabani, Yacoob teaches the following:

[0028] According to the two-phase flow cleaning method of the present invention, droplet size plays an important role in the cleaning process since the inertial impact of the droplet is tangible, and become very

significant at the optimal droplet size, between 30 to 200 microns. Droplets that are too small have inertial impact forces that are too low to achieve fragmentation and detachment of biofilm and like contaminants from the lumen of passageways. The larger the droplet, the larger is its kinetic energy, and the larger is biofilm fragmentation for example. However, in the two-phase flow of this invention, the optimal droplet size is determined by the flow conditions and parameters mentioned above. The two-phase flow of the present invention optimizes droplet size without compromising the main flow attributes needed to cover the entire lumen surface and length of the passageway to be cleaned; and at the same time ensure that the liquid boundary layer is either very thin or discontinuous. The purpose of the latter condition is to keep the contaminant bare such that the droplets directly or nearly directly impact the contaminants, causing their fragmentation, erosion and detachment. Droplets that are too small are not effective for cleaning and thus can be entrained in the gas phase without impacting the lumen surface of the passageway. On the other hand, very large droplets, e.g., those that are >200 microns in size are difficult to create and re-suspend (in the gas flow) in an efficient manner.

Concerning the vessel, Tabani, Yacoob teaches the following:

[0211] Cleaning apparatus 100 and the two-phase cleaning process were used to perform clean-in-place (C-I-P) operations of reverse osmosis (RO)

membrane elements, part of a wastewater system, with noted success. In this case, the system to be cleaned 400 consisted of a single 4 inch RO pressure vessel (made by Osmonics Corporation) having two spiral wound RO elements (FilmTec TW30-2540) connected in series. The above RO pressure vessel was piped with a feed inlet, a permeate outlet for purified water and a concentrate outlet.

Concerning the interior surface and the interior surface, Tabani, Yacoob teaches the following:

[0141] A 1.4 mm internal diameter tubing having a length of 24 inches (L/D=435) was covered with a highly adherent biofilm on its interior surface and cut in three equal sections, designated as A, B and C.(par#174)

Concerning the back pressure, Tabani, Yacoob teaches the following:

[0070] The holding tank 14 is provided by first pumping means 30 via pipe segments 199, 198, 200, 202, 204, 205, 210, 212 and 214 through valves 84 and 76 at a pre-defined liquid pumping rate. Liquid pressure is monitored by a liquid pressure transducer 74. A return loop via pipe segments 209, 194, 192 and 193 through the manual valve 88 serves as a pressure adjustment means to maintain the desired pressure range necessary for operating the nozzle 13 in the two-phase generating module 12 during the cleaning period in order to avoid back pressure to other parts of the apparatus. The cleaning solution is then atomized/dispersed at the nozzle 13 and mixed with air to generate the two-phase cleaning mixture which is then directed to the inlet adapter 56 connected with the passageway to be

cleaned 400 via pipe segments 138, 140, and 142 through valve 54. Thermocouple 52 is employed to measure the two-phase mixture temperature before entering the passageway to be cleaned 400. The two-phase exhaust leaving outlet adapter 58 connected to the passageway to be cleaned 400 is then directed to mist separator 500 via pipe segments 144, 146, 148 and 150 through valve 62. The exhaust pressure is monitored at pressure transducer 60. The liquid phase is then separated from the two-phase mixture inside the mist separator 500 and discharged via pipe 152 through valve 64, and gas is discharged via a ventilation duct 154. In this process the desired mixture temperature is controlled by the liquid heater 15 and air heater 11, and is monitored by the thermocouple 52 with a feedback loop to the controller 600.

Concerning the flow rate and the gal/min, Tabani, Yacoob teaches the following:

[0158] The nozzle used to generate droplets for the two phase flow used in cleaning, rinsing, and sanitizing the pipeline was designed to supply liquid droplets in the range between 25 to 400 microns using three different pumps. The process steps for performing the entire cleaning, rinsing and sanitizing cycles were controlled. First, initial testing to determine gas and two-phase flow velocities at the inlet and outlet of the piping system was performed. Water was supplied at different flow rates to the two-phase generating module 12 through the third pumping means 34. Air was regulated using a pressure regulator 42 and a flow

meter 50 to cover an air pressure range between 10 to over 30 psig. The two phase flow delivered to the piping system through the inlet adapter 56 was controlled to provide two phase flow having pressures between 12-32 psig and liquid flow rates ranging from 0 to 1.2 gpm. The air and liquid flow rates used in this experiment covered gas to liquid ratios between 900:1 to 27,000:1.

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Materna, Peter A. (US6454871).

Concerning the two-phase and the inlet line, Materna, Peter A. teaches the following:

In the case of a hemodialyzer, the permeability of the membrane is such that the quantity of water or liquid which seeps through the membrane during the cleaning process, if the dialysate side is pressurized to a higher pressure than the interior of the hollow fiber, may be sufficient to create the two-phase flow situation inside the hollow fiber. In this manner it may be possible to provide only flow of dry gas into the passageway. This gas flow would then become two-phase as a result of mixing with the permeated liquid. In this case the two-phase flow would have an increasing liquid content as it progresses from the inlet to the outlet of the passageway, due to additional liquid seeping in along the passageway. In itself, this variability of liquid fraction is not an intended feature of this mode of operation, but it may be convenient.(see col. 20, lines 48-62)

Concerning the liquid phase, multiple phase and the gas to liquid ratio, Materna, Peter A. teaches the following:

> The mixed-phase flow has a high volume ratio of gas to liquid and certain combinations of liquid properties. The advantage of a mixed-phase cleaning system is that it combines the best of both liquid and gas flow. It can have an overall pressure drop per unit length which is acceptably small as governed mostly by the characteristics of the gas flow, but the liquid phase is moving with the gas at a substantial velocity. Therefore, at the places where the liquid phase interacts with the wall there can be high-velocity impact of the liquid in certain places and an accompanying high local shear or impact stress.(see col. 6, lines 33-43)

Concerning the gaseous phase, Materna, Peter A. teaches the following:

> In the case of a dissolved gas, a useful gas is carbon dioxide because it is relatively soluble in water. However, air can be used as well. The solubility of any gas in water is dependent on the absolute pressure to which the solution is exposed; thus a decrease in pressure can cause a gas to come out of solution and form bubbles. As liquid flows through a permeable membrane, depressurization occurs. On the upstream side of the membrane, at the higher pressure, a certain concentration of gas can stay in solution in the liquid. On the downstream side of the membrane, which is at a lower pressure, a smaller amount of gas can stay in solution, and the rest comes out of solution as bubbles. The bubbles form directly

within the pore structure, where debris needs to be removed, and thus the debris is dislodged. The debris may serve as nucleation sites for the formation of bubbles. This is an efficient use of dissolved gas in a liquid. Two other gases which are significantly soluble in water are sulfur hexafluoride and nitrous oxide, although all gases are soluble in water to some degree. If oxygen or ozone is present in the gaseous phase, an oxidative or disinfectant effect can occur.(see col. 8, lines 22-42)

Concerning the interior surface, Materna, Peter A. teaches the following:

Interior surfaces of passageways such as small-bore tubing, pipes, ducts and the like, which may carry fluids such as liquids, gases, slurries or aerosols, are very difficult to clean and to maintain in a clean condition. When the flow path is long and narrow, or hard to reach, it is difficult to clean the surfaces by conventional liquid phase flushing because such a long, narrow passageway limits liquid flow velocities by creating a high resistance to flow. As a result, shear stresses which could aid in the removal of contaminants from such surfaces are limited. Low flow velocities also limit the usefulness of solvents for the same reasons.(see col. 1, lines 15-26)

Concerning the flow rate and the gas to air ratio, Materna, Peter A. teaches the following:

The volumetric ratio of gas and liquid is also important for achieving cleaning. As will be described hereinafter, typical ratios of gas (usually

air) to liquid cleaning solution are 50:1 to 6000:1, with that ratio being considered to be the flow rate of gas at standard conditions, i.e., one atmosphere (absolute) of pressure and 0.degree. C., relative to the volumetric flow rate of the liquid solution. If too much liquid is present, the regime of slug flow occurs, and it is difficult to achieve sufficiently high velocities and to achieve droplet formation and ripping off of droplets from the liquid layer on the wall. Too little liquid cannot achieve good cleaning in a reasonable period of time, simply because there are not sufficient droplets to impact the wall often enough. This could in principle be overcome by lengthening the treatment time, but at the expense of convenience. For a given source pressure, the flow rate of gas can be measured when only gas is flowing through the surface being cleaned. At the same source pressure, the flow rate of gas for mixed-phase flow is measured by placing the flow meter upstream of the mixing point. It is usually found that for conditions conducive to good cleaning, the gas flow rate for the mixture is at least 40% of the flow rate of dry gas alone.(see cols. 10-11)

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Schleiffarth, James W. (US6365005).

Concerning the clean-in-place, vessel, spray, inlet line and the interior surface, Schleiffarth, James W. teaches the following:

> The evaporation vessel 12 contains a vapor disengagement section 44 above the level of the liquid being evaporated. Optionally, full spray nozzles 49 spray liquid feed or other suitable liquid (such as process water) into the vapor disengagement section to assist the disengagement of the vapor from mist and other liquid droplets. Mist eliminators 46, 48 with clean-in-place nozzles 47 are placed above the full spray nozzles 49. The vapor compressor inlet line 34 is between the blower or compressor 10 and the top of the evaporation vessel 12. The evaporation vessel has a closed top 65 and a closed bottom 64, each of which may be generally of any shape. In applications where the feed contains precipitates or solids (such as wastewater), the closed bottom 64 may have a conical shape to facilitate sliding of the solids to the concentrate outlet line 38. If the bottom is conical, a preferred shape is a cone having an interior cross-section angle of 60 degrees.(see cols. 3-4, par#71)

Concerning the liquid phase, multiple phase, flow rate and the gal/min, Schleiffarth, James W. teaches the following:

> The operational parameters of the distiller are chosen so as to maintain a liquid, rather than a gaseous, flow throughout the primary heat exchanger 18. This is done by maintaining the recirculating flow rate at a value 25 to 200 times the feed rate of the liquid to be evaporated. The feed pump 56 has a variable speed drive which can vary the heat recovery of the secondary heat exchanger. In one embodiment, the variable speed drive is

rated from 0 to 7 gal/min and is operated at 4 gal/min, or approximately 6000 gallons per day. The recirculation pump 40 is a 5 hp unit, operated at 20 psig to produce 200 gal/min. The recirculation pump rate is preferably controlled manually by reading a pressure gauge on the output side of the recirculation pump 40 and by adjusting a flow control valve to achieve the proper operational pressure. Transfer of heat from the compressed vapor may result in local boiling of the liquid inside the evaporation loop 16 above the primary heat exchanger 18. The recirculation rate is fast enough to entrain the vapor bubbles in the liquid in the primary heat exchanger 18 and to maintain a turbulent-flow, single liquid phase throughout the primary heat exchanger 18, thereby increasing the heat transfer to the recirculating liquid.(see cols. 7-8)

Concerning the gaseous phase, Schleiffarth, James W. teaches the following:

As used herein, the term "steam" means the gaseous phase of the liquid being evaporated, whether the liquid is water or not. Although the description above contains many specifics, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Various other embodiments and ramifications are possible within the scope of the invention. For example, this vapor compression distiller can be used to process a wide variety of materials under significantly different conditions while maintaining a highly turbulent liquid flow

through the primary heat exchanger which has significantly reduced fouling characteristics. Furthermore, the flexibility in addition of the makeup heat in the form of steam allows for either the more efficient method of heat transfer by direct steam injection into the material being evaporated or by indirect means by feeding this makeup steam into the hot side of the primary heat exchanger. This would have the further benefit in not diluting the material to be evaporated during system startup.(see cols. 8-9)

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Wei, Guang-jong Jason (US6183708).

Concerning the liquid phase, gaseous phase, vessel, multiple phase and the spray, Wei, Guang-jong Jason teaches the following:

The process described above is preferably used as a pretreatment, alongside additional peroxy acid composition treatments. These additional treatments are preferably carried out in a device where intimate contact between a gas phase and a finely divided liquid phase or a finely divided gas phase and a liquid phase is obtained. Such devices, including sparged and agitated vessels and the various types of tray towers, can contact a gas phase with a liquid and can disperse the gas phase into bubbles or foams. Tray towers are typically the most important of these since countercurrent multistage contact and other contacting can be obtained. The gas can be contacted in the form of a finely divided or small bubble into a bulk

liquid in a sparged vessel (bubble column). Finely divided gas or atmospheric bubbles can be dispersed into a mechanically agitated vessel in which the liquid contents are agitated to ensure close contact with the finely divided bubbles and the liquid. Multistage absorption can be obtained using multistage tray towers using a variety of towers, baffles, barriers, downspouts and other mechanical means to ensure close contact between the gas phase and the liquid phase. Venturi scrubbers can be used along with wetted-wall towers, spray towers and spray chambers, packed towers, and any other countercurrent or cocurrent apparatus that can ensure close contact between the atmospheric or odor containing gas phase and the liquid treatment. The process can be run either continuous or in semibatch or batch mode. During the process, the accumulated treatment composition containing a substantial quantity of the odor compounds and the oxidized odor compounds are removed from the process equipment and directed to typically on-site treatment or municipal sewage treatment plants. In smaller applications, or liquid/liquid applications a venturi system is preferred while in larger applications, a countercurrent scrubber towers can be preferred.(see cols. 5-6, par#121)

Concerning the delivery head, Wei, Guang-jong Jason teaches the following:

There are a number of different ways to form the droplets of the desired size. Most atomizers can be categorized into one of three common categories: pressure nozzles, two-fluid nozzles and rotary devices. These

devices are available commercially from Spraying Systems Company. The degree of atomization is determined by the fluid and or gas pressure along with the spray head bore size and design. The specified droplet size can be determined from commercial correlation charts which are available from suppliers. Preferably, an air injected atomizing nozzle is used. This type produces a much smaller droplet size in the range of 20 to 40 .mu.m.(see col. 5, lines 50-60)

Concerning the spray diverter, Wei, Guang-jong Jason teaches the following:

The scrubber tower 8 is used to provide the necessary contacting area between the peroxyacid containing aqueous stream 7a and the odor-causing compounds within the gaseous phase 2a. The tower operates countercurrently, meaning that the aqueous stream 7a enters at the top and exits the bottom while the air stream 2a enters the bottom and exits at the top. The air stream 8b exiting the top of the tower flows to an optional stack 10. The aqueous stream 8a exiting the bottom of the tower flows to diverter valve 8", which recycles a portion of the aqueous flow back to the holding tank 6 while diverting the remainder as waste stream 9. Alternatively, the contacting column 8' can also operate cocurrently.(see col. 12, lines 1-10)

Concerning the flow rate, Wei, Guang-jong Jason teaches the following:

The invention is concerned with a process whereby a finely divided or fogged peroxy acid composition is used to augment an odor reduction process. It has been found that a fogged peroxy acid composition is highly effective at odor reduction. Preferred average droplet size ranges from 25

to 500 .mu.m (10.sup.-6 m) in diameter, with a more preferred size range of 30 to 100 .mu.m and a most preferred range of 30 to 60 .mu.m. By contrast, conventional treatments utilize spray droplets which range from 1000 to 100,000 .mu.m. Without being limited by theory, it is believed that the augmented effectiveness is due to the vastly greater droplet surface area, which results in a greatly expanded level of contact surface between the peroxy acid droplets and the odor causing compounds. This makes it possible to greatly reduce the volume of aqueous peroxy acid solution used. While copending application Ser. No. 09/007,225 discloses an aqueous flow rate of about 9 to 100 gallons per minute, the claimed invention is able to make effective odor control with reduced particle size at use flow rates of about 0.1 to 3 gallons per minute.(see col. 5, lines 30-50)

Concerning the inlet line, Wei, Guang-jong Jason teaches the following:

FIG. 2b shows a portion of FIG. 2a, demonstrating how the peroxy acid pretreatment of the invention can be incorporated into the greater odor reduction scheme outlined in FIG. 2a. Specifically, the odor laden inflow 21 is seen passing through the air inlet 35. A compressor 32 and a peroxy acid solution source 33 are used to provide an atomized pretreatment spray via atomizer 34. The pretreated air then passes along to receive additional treatment as seen in FIG. 2a.(see col. 5, lines 1-10)

Concerning the interior surface, Wei, Guang-jong Jason teaches the following:

In conventional odor reduction treatment processes, an aqueous solution is

dispersed at the top of the scrubber apparatus. In typical applications, the aqueous treatment composition passes through the scrubber at a rate of about 100 to 30,000 L-min.sup.-1, depending upon the size of the scrubber. Typically, the scrubber is a vertical wet scrubber having interior packing. The aqueous solution passes through the column packing in a finely divided form comprising streams, droplets, etc. through the column packing. The rate of solution flow is adjusted depending upon the size of the scrubber, the volumetric flow rate of gas, and the soil level of the gas.(see col. 10, lines 55-65)

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by David W. Gruszczynski (US5941257).

Concerning the clean-in-place and the interior surface, Gruszczynski II, David W. teaches the following:

Several different techniques have been used in order to clean the interior of piping systems. These clean-in-place techniques include pigging, brush cleaning, lances and fluid flow or hydrodynamic cleaning. Pigging and brush cleaning require direct physical contact of a tool with the interior of the pipe. Pigging, brush cleaning and lance cleaning techniques can all be time consuming and require special equipment. For that reason, hydrodynamic cleaning is generally the method of choice for cleaning operations which require quick turn around time and/or relatively low

cost.(par#130)

Concerning the two-phase, back pressure and the flow rate, Gruszczynski II, David W. teaches the following:

A method for hydrodynamic cleaning of a piping system using two-phase flow. A model for predicting peak wall shear stress for two-phase flow is used to determine an optimum flow rate ratio which achieves a maximum wall shear stress in the particular piping system to be cleaned. The optimum flow rate is first established by turning on the liquid and gas flows through the piping system to be cleaned and allowing the flow to reach steady state conditions. The back pressure of the system is measured and the optimization model is used to determine the optimum flow rate ratio. Once the optimum flow rate ratio has been calculated, the liquid flow rate and the gas flow rates can be adjusted such that the optimum ratio is achieved. The two-phase back pressure is then measured to verify that the optimum flow rate ratio has been used. This is done by comparing the measured optimum two-phase flow back pressure with the initial two-phase back pressure used in the equations. If there is a variance between the two back pressures then the measured back pressure is substituted into the equations for the initial back pressure and the optimum flow rate ratio is recalculated. This step is repeated until the measured back pressure is equal to the back pressure used in the calculations. Cleaning is then performed at that optimum flow rate ratio.(see abstract)

Concerning the liquid phase, gaseous phase and the multiple phase, Gruszczynski II, David W. teaches the following:

> This equation includes the frictional component of the pressure drop and does not include the accelerational and gravitational aspects of the pressure drop (considered negligible in most cases). The correlation solves for the frictional pressure gradient by employing a relationship between the frictional pressure gradient for the gas phase or liquid phase flowing alone in the channel, in terms of frictional multipliers, as shown in Equation 2:(par#171)

Concerning the gal/min, Gruszczynski II, David W. teaches the following:

> Through the practice of the method of the present invention, two-phase hydrodynamic cleaning of stationary piping systems can be optimized. Optimization of the liquid and gas flow rates for hydrodynamic cleaning is accomplished through experimental and semi-analytical analysis of two-phase flow in tubular geometry. In the experimental analysis, the cleaning efficiency of two-phase flow was measured at different flow rates for different system configurations. The data demonstrates that there is a maximum cleaning efficiency with respect to the ratio of air and water volumes. This data is presented in FIG. 1 which is a graph plotting shear stress in arbitrary units versus the flow rate ratio (scfh/gpm). The data presented in FIG. 1 was collected for a piping system comprised of 5/8" diameter pipe with actual measurement occurring at 50 feet from the source

> of the two-phase flow entrance into the piping system. The data further demonstrates that the maximum cleaning efficiency changes with different system back pressures. Thus, optimum flow rate ratio is dependent on system back pressure. The experimental data shows that at flow rate ratios higher than the optimum ratio, the cleaning efficiency decreases. This result is contrary to the results shown in the Tragardh and VonBockelmann article which appeared in the 1980 issue of the Journal of Food Process Engineering 3. Tragardh and VonBockelmann had concluded that cleaning efficiency increases with flow rate ratio.(par#160)

Concerning the gas to liquid ratio, Gruszczynski II, David W. teaches the following:

> It should be understood that as the ratio of air flow to liquid flow increases, the average density and viscosity of the two-phase flow solution decreases. However, the ratio of gas to liquid at which the optimum flow rate occurs is certainly not apparent. It is further surprising that the optimum flow rate ratio changes as the system back pressure changes.(par#242)

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Simpson (US 5,783,245).

Concerning the CIP processing and the internal surface of the vessel Simpson teaches the following:

(4) Fluid milk storage plants are generally known in the art. They typically include a holding or storage tank or vessel equipped to store the fluid milk product. By way of example, the tank may be provided as a semi-trailer or the like that is loaded from a dairy farm. Alternatively, the tank may be a component of a dairy processing system. When the milk tank is emptied such as by gravity feed or appropriate pumping of the contents to another location, residual milk product remains within the tank and associated pipelines. In known systems, such residual milk product is now removed with the use of various cleaning cycles. These typically include a rinse cycle and/or a clean-in-place cycles wherein the residual milk is washed away from the milk plant.

Concerning the flow and the geometry of the spray system Simpson teaches the following:

(11) FIG. 2A also illustrates a raw milk storage tank 12' that has already been emptied. The storage tank 12' has a liquid spray system 36 downwardly extending therein which is secured at an opening formed in the top of the storage tank 12'. The spray system 36 is of general type that is normally adapted to apply a cleaning spray solution to the inner walls of the storage tank 12'. According to the invention, the spray system 36 is adapted to apply a burst of treatment fluid received from a treatment fluid supply 18 to the inner walls of the storage tank 12' in one mode of operation. In accordance with the invention, this action provides a milk rinse solution that is passed through conduit 38 disposed at the outlet of the storage tank 12' to the valve cluster 34.

Concerning the spray apparatus for the CIP cleaning Simpson teaches the following:

(16) After the treatment fluid is provided as a burst through the spraying system disposed in the tank 12', the diluted milk fluid is passed through the valve cluster 34 and to a double-seated valve 64. The valve selectively diverts the dilute fluid to the recovery tank 14 via a conduit 69. These double-seated valves 64 and 66 also isolates the diluted milk line from the incoming raw milk line and insures that no adulteration of the raw milk will occur. As noted above, raw milk provided through the valve 64 is thereafter passed through a second double-seated valve 66 and supplied through a line 68 to appropriate further processing apparatus. For example, the raw milk may be supplied to a plate cooler or the like as will be understood by those skilled in the art.

Claims 8-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Welch, Elmer S. (US5603826).

Concerning the clean-in-place, Welch, Elmer S. teaches the following:

Clean-in-place systems are cost effective. Operating time for the clean-in-place system, and down-time for the process system are minimized because such clean-in-place systems are permanently installed to the processing system. Moreover, such clean-in-place systems provide superior results as compared to manual cleaning. Nevertheless, there are some disadvantages associated with presently used clean-in-place systems.(see col. 2 lines 50-60)

Concerning the vessel, Welch, Elmer S. teaches the following:

In many such known return pump systems, solution is not completely removed from the vessel to be cleaned, and thus is not fully returned to the cleaning system. In an ideal arrangement, the vessel which is being cleaned should be kept free of standing liquid during the rinse and cleaning cycles to maximize the removal of soil and contaminating materials. However, in such systems, sufficient solution level must be maintained in the vessel in order to provide adequate prime for the pump. Thus, in such return pump systems, the solution level in the tank cannot be kept sufficiently low to maximize vessel cleaning. Moreover, after the return pump is stopped, some solution remains in the vessel. This remaining solution may carry into the next step of the clean-in-place cycle and effectively recontaminate the cleaned vessel.(see col. 2, lines 15-35)

Concerning the flow rate and the gas/liquid multiphase system, Welch, Elmer S. teaches the following:

A self-cleaning return pump system for use with a clean-in-place system for

cleaning vessels includes a recirculation loop for providing flow communication including a return pump, an eductor, and a separator. The return pump is arranged to discharge a liquid through the eductor into the separator and is supplied with a substantially continuous flow of liquid from the separator. A return line provides flow communication between the vessel to be cleaned and a suction port of the eductor. The separator has a top discharge port and a bottom discharge port. The top discharge port is configured to discharge a liquid or a liquid-air mixture therefrom to the clean-in-place system. The return pump causes liquid flowing through the recirculation loop at the eductor to have sufficient dynamic head to draw liquid or a mixture of liquid and air from the vessel through the return line, into the eductor. The liquid or liquid air mixture is discharged into the separator. The bottom discharge port of the separator provides the substantially continuous flow of liquid to the return pump and substantially all of the air and a portion of the liquid is discharged from the separator top discharge port at a flow rate sufficiently high to maintain a flow of liquid across the bottom of the vessel to maintain the liquid therein in a state of substantially continuous flow. The liquid is discharged from the separator top discharge port at a rate of flow about equal to the rate of flow of liquid supplied to the vessel through the supply line.(see abstract)

Concerning the flow rate (i.e. gal/min), Welch, Elmer S. teaches the following:

In a current embodiment of the system, the flow rate through the separator is in a range of about 200 to about 300 gallons per minute (gpm), preferably about 250 gpm, with a wetted separator volume of about 8 gallons, which results in a residence time t.sub.r in a range of about 1 to 3 seconds. Thus, because of the short residence time, and the high rotational velocity of the liquid, the sludge does not have the opportunity to accumulate in the separator 20 and is essentially washed out to the C-I-P system 12 and preferably to the drain 50. During the initial rinse mode, the recirculation loop 14 is essentially operated in a flooded state, with velocities at the separator inlet of about 10 to about 20 feet per second.(see col. 7, lines 10-30)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325. The examiner can normally be reached on 9:00-17:30 (m-f).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglass McGinty can be reached on (571)272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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